Response of french Zymoseptoria tritici populations to temperature at different spatio-temporal scales

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Response of French *Zymoseptoria tritici* populations to temperature at different spatio-temporal scales

Temperature affects epidemiological processes by impacting the development of foliar pathogens. Our overall objective is to characterize the response of *Zymoseptoria tritici* to temperature and its adaptive potential to thermal variations occurring at various spatio-temporal scales. First, at individual scale, we have established that the development of *Z. tritici* on adult plant leaves is affected not only by the daily average leaf temperature, but also by its amplitude. Second, at field population scale, we have studied the impact of thermal seasonal fluctuations on population dynamics. To do so, we have selected two French *Z. tritici* populations, respectively sampled at the beginning (before winter) and at the end (after spring) of an annual epidemic. Isolates collected at the end of the epidemic were more aggressive compared to the initial population whether under winter (higher sporulation capacity) or spring conditions (shorter latency period). Moreover, looking at the phenotypic variability, we have shown that the population dynamics resulted from a successive selection of individuals driven by temperature and that a short term adaptation may occur inside populations at the annual scale. Third, at countrywide population scale, we have investigated the heterogeneity of temperature responses of French *Z. tritici* populations. Isolates from six locations having contrasted annual mean and range of temperature were collected. Then the thermal performance (considered here through the pathogen multiplication rate) curves of nine isolates per location were established in vitro. These results have not highlighted a clear adaptation pattern along temperature gradients, while a differing temperature sensitivity between *Z. tritici* populations sampled in contrasting climate zones on a global scale has been reported in the literature. Thus, these population-based approaches have underlined that response to temperature may diverge between populations: (i) locally within a year due to a short term selection resulting from successive climate conditions: (ii) on a global scale which could be partly explained by genetic differentiation. The variability of thermal performance curves within and between populations and its epidemiological consequences on disease (polycyclic) dynamics will be further explored by conducting competition experiments and through modelling in order to assess the ways in which populations can adapt to thermal changes.